Medical Science

25(116), October, 2021

Endoscopic retroperitoneal lumbar sympathectomy in treatment for chronic lower limb non-atherosclerotic ischemia

Tran Vinh Hung, Nguyen Van Viet Thanh✉

To Cite:
Hung TV, Thanh NVV. Endoscopic retroperitoneal lumbar sympathectomy in treatment for chronic lower limb non-atherosclerotic ischemia. Medical Science, 2021, 25(116), 2617-2623

Author Affiliation:
Binh Dan Hospital, General Surgery Department, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

✉**Corresponding author**
Binh Dan Hospital, General Surgery Department, Pham Ngoc Thach University of Medicine,
Ho Chi Minh City, Vietnam
Email: thanhnvv.bmngoai@pnt.edu.vn

Peer-Review History
Received: 10 September 2021
Reviewed & Revised: 12/September/2021 to 05/October/2021
Accepted: 07 October 2021
Published: October 2021

Peer-review Method
External peer-review was done through double-blind method.

ABSTRACT

From January 2018 to December 2020, we performed a retrospective study on 32 cases of chronic lower limb non-atherosclerotic ischemia, included: 24 Buerger patients and 8 Raynauld patients. Patients' average age was 36.9 years. Male was 4 times more than female. Chief complaints were pallor and leg pain. History of disease was 12.7 months. 93.75% of the lesions happened on one leg. Smoking (81.25%) was prominent risk factor. All cases were successfully performed by endoscopic retroperitoneal lumbar sympathectomy with accurate histopathological result of sympathetic nervous tissue. Operation time: 70.5 ± 11.5 minutes, post-op days: 4.2 ± 2.1 days, hospital days: 10 ± 7.7 days, blood loss volume: 10.3 ± 4.9 ml. There were not operative accidents or complications. In post-op period, 43.75% of the patients had mild pain, others were without pain. 100% of the wounds healed well, no infection was recorded. Short-term results showed a statistic significance of 6 improved symptoms against preoperation. The improved symptoms include: numbness, intermittent claudication, rest pain, pulselessness, coldness, pallor. The mid-term results showed a statistic significance of 6 improved symptoms against preoperation: numbness, intermittent claudication, rest pain, pulselessness, coldness, pallor. But, compared with short-term results, there were 8 progressive symptoms: numbness, intermittent claudication, rest pain, coldness, pallor, gangrene, paralysis. After endoscopic retroperitoneal lumbar sympathectomy, time of amputation was 39.6 months. The common amputation ratio in our study was 25% but the amputation ratio of Buerger group was 33%. Absolute effect on Raynauld group (1 year post-op) showed no case of leg ischemia, no case of amputation.

Keywords: endoscopic retroperitoneal lumbar sympathectomy

1. INTRODUCTION

Chronic lower extremity ischemia is a narrow or complete blockage of main artery that supplies blood to the legs. Causes are divided into 2 main groups:

atherosclerosis and non-atherosclerosis (with two prominent diseases: Buerger and Raynauld). In cases of revascularization surgery no longer indicated, a gentle choice is lumbar sympathectomy, especially in non-atherosclerotic occlusion group (Chander et al., 2004). Besides, in patients with chronic non-atherosclerotic occlusion, lumbar sympathectomy plays an important role in treatment: pain relief, improving vascularization, and quality of life. Endoscopic retroperitoneal lumbar sympathectomy is performed by retroperitoneum approach which overcomes the disadvantages of the open procedure (Della Giovampaola et al., 2006). Improved postoperative pain, quick recovery time, reduced hospital days and complications are greater outcomes that this method brings to patients (Baker and Lamerton, 1994). We carried out this study to evaluate the effectiveness of endoscopic retroperitoneal lumbar sympathectomy in treatment of non-atherosclerotic chronic lower extremity arterial occlusion.

2. METHODS

From January 2018 to December 2020, we performed a cross-section study in patients with chronic lower limb non-atherosclerotic ischemia in 2 diseases: Buerger and Raynauld, at Binh Dan hospital, Vietnam. They had to satisfy both: (1) The treatment was endoscopic retroperitoneal lumbar sympathectomy and (2) The follow-up period after surgery was at least 1 year.

The Exclusion criteria were: (1) Patients were treated by revascularization at the same time with endoscopic retroperitoneal lumbar sympathectomy: lower extremity bypass surgery, lower extremity angioplasty, endarterectomy procedure, or stent. (2) Patients were performed endoscopic thoracic sympathectomy at the same time with endoscopic retroperitoneal lumbar sympathectomy.

Surgical procedure

- Anesthesia method: endotracheal anesthesia.
- Surgical position: The patient was placed in a lateral position with pillow under hip. The operating table was separated by 30° to increase the space available between the last rib and the iliac crest.
- Trocar positions: we mostly used 3 trocars. The first trocar (10mm) was placed on the posterior axillary line, at the head of the 10th rib. The second trocar (5mm) was placed on the posterior axillary line close to the iliac crest. The third trocar (10mm) was placed toward the patients' abdomen. The position was the apex of an equilateral triangle which side was the length between the first and second trocars. In cases of difficulty, a fourth trocar (5mm) could be used. Its position depended on the specific situation.
- The operative space was created by balloon and maintained by CO_2 pump with 12 – 15 mmHg pressure.
- Dissected and exposed lumbar sympathetic ganglion chain and adjacent anatomical structures: ureter, genital vascular, psoas muscle, spine, abdominal aorta (left-sided) and abdominal vena cava (right side).
- Sympathetic ganglion chain was dissected and cut from L2 to L5 for pathology.
- Withdrawed trocars, discharged CO2, sutured the skin of incision.

3. RESULTS

Sample characteristics

The average age of patients was 36.9 ± 16 years, the youngest was 16 years old, and the eldest was 75 years. There were 26 male patients (81.25%), 6 female patients (18.75%) and male was 4 times more than female. Our study had 24 Buerger cases (75%), 8 Raynauld cases (25%). Buerger group was 3 times more than Raynauld group. Smoking was the major risk factor (81.25%) and was presented in all patients of Buerger group. 37.5% of cases had a history of vascular disease in both of upper extremities and lower extremities. Especially, in Raynauld group, all patients had been associated with peripheral artery disease of the upper extremities. 9.38 % of cases in study had history of lower extremity vascular surgery.

Symptoms and stages of the disease

We recorded that patients admitted to the hospital because of rest pain (75%) and pallor (25%). In our study, the chief complaint in Buerger group was rest pain, while it was pallor in the Raynauld group. 93.75% of patients had lesions on one leg, only 2 cases (6.25%) in the Buerger group were involved in both legs but not at the same time. The average symptoms' onset time in our study was 12.7 ± 3.5 months (min: 8 months, max: 24 months).

We investigated 10 symptoms: intermittent claudication, rest pain, numbness, pulselessness, pallor, coldness, dystrophy of legs, gangrene, paralysis, and ABI. We found all symptoms presented in Buerger group but only 6 symptoms - intermittent claudication, rest pain, numbness, ankle pulselessness, coldness, and pallor- were presented in the Raynauld group. In our study, 100% of patients had numbness. 75% of patients had intermittent claudication; and the ratio of intermittent claudication was the same in

walking over 200m as walking less than 200m. Other symptoms presented with different rates, specifically: rest pain (75%), ankle and popliteal pulselessness (75%), dry gangrene (15.63%), paralysis (6.25 % feet, 9.38% toes), foot dystrophy (40.6% nails, 34.4% skin and nails), coldness and pallor (28.1% feet, 71.9% toe). The ABI of the injured leg was severe in all Buerger cases, accounting for 75% of the patients in the study.

The results of lower extremities MSCTA showed normal arteries (25%) and vascular injury (75%). Stenosis was more than 75% of the diameter, occurred under the popliteal artery. All Buerger patients had popliteal artery stenosis and complete occlusion at distal run-off: anterior tibial artery, posterior tibial artery, and peroneal artery. But, Raynauld group showed normal results of lower extremities MSCTA.

According to Leriche & Fontaine's classification, we recorded stage 1 (25%), stage 3 (59.38%), stage 4 (15,63%). Raynauld group was in satge 1 while Buerger group was in stage 3 – 4. Two factors (disease group and stage of disease) were statistically analyzed, and result: $\chi 2 = 32$. They showed statistically significant difference with $p < 0.01$

Outcome of operation and perioperative results

100% of cases were successfully performed by endoscopic retroperitoneal lumbar sympathectomy. There were 93.75% of cases on one side, 6.25% of cases on both sides. 100% of postoperative pathological results were sympathetic nerve tissue. No case needed drainage after surgery. Surgical complications were not recorded. Operation time was 70.5 ± 11.5 minutes (min: 45 minutes and max: 90 minutes). The average blood loss volume was 10.3 ± 4.9 ml (min: 5 ml anh max: 20 ml).

Hopital days were 10 ± 7.7 days, 3 days at least and 28 days at most. Hospital days of the Raynauld group (3.25 days) were statistically significant ($p < 0.01$) less than hospital days of Buerger group (12.38 days). Moreover, hospital days of disease's stages (stage 1: 3.25 days, stage 3: 10.16 days, stage 4: 20.8 days) were statistically different with $p < 0$ .05 (Post Hoc – Tamhane's T2 test). Post-op days were 4.2 ± 2.1 days (min: 2 days and max: 7 days). Post-op days of Raynauld group (2 days) were statistically significant ($p < 0.01$) less than post-op days of Buerger group (4.96 days). And, post-op days of disease's stages (stage 1: 2 days, stage 3: 4.53 days, stage 4: 6.6 days) were statistically significant with $p < 0.01$ (anova test).

We evaluated 5 surgical complications in perioperative period: bleeding, ureteral injury, bowel injury, abscess, subcutaneous emphysema. The results did not show any cases. About post-op pain, 56.25% of cases did not feel any pain in the first post-op day, 43.75% of cases had mild pain (level 1 – 3, according to the pain scale) (Hawker et al., 2011; Woessner, 2006). We also found that 100% of the incisions healed well. There were no cases of bleeding or infection in perioperative time.

Short-term outcome

We investigated 10 symptoms: intermittent claudication, rest pain, numbness, pulselessness, pallor, coldness, dystrophy of legs, gangrene, paralysis, and ABI.

In Buerger group: Six symptoms - intermittent claudication, rest pain, numbness, pulselessness, pallor, and coldness- were statistically significant ($p < 0.05$) better than preoperation. Four symptoms - dystrophy of legs, gangrene, paralysis, ABI - were unchanged.

In Raynauld group, 6 symptoms: intermittent claudication, rest pain, numbness, pulselessness, coldness, and pallor were absent after operation.

Mid-term (1 year follow-up) outcome

In 1 year follow-up period after surgery, we also investigated 10 symptoms: intermittent claudication, rest pain, numbness, pulselessness, pallor, coldness, dystrophy of legs, gangrene, paralysis, and ABI.

In Buerger group, compared with preoperation and short-term results: Six symptoms: intermittent claudication, rest pain, numbness, pulselessness, pallor, coldness were statistically significant ($p < 0.05$) better than preoperation but less than short-term results. Four symptoms - dystrophy of legs, gangrene, paralysis, ABI - were statistically significant ($p < 0.01$) less than preoperation and short-term results. They showed trend of "progressive disease".

In Raynauld group, 6 symptoms - intermittent claudication, rest pain, numbness, pulselessness, coldness, and pallor - were still absent after operation within 1 year.

Amputation event

Overall ratio of amputation was 25%. Amputations were happened at feet and toes. But, specific amputation rate of Buerger group was 33%, while Raynauld group had no amputation. Overall time of amputation was 39.6 ± 3.2 months (Figure 1). Compared with disease stages, amputation time of disease stages were statistically significant difference ($\chi 2 = 32.13$, $p < 0.01$). Results showed the

more severe stage, the shorter amputation time (Figure 2). Compared with disease groups, amputation time of Raynauld group was statistically significant ($\chi 2 = 4.22$, $p < 0.05p$) longer than Buerger group (Figure 3).

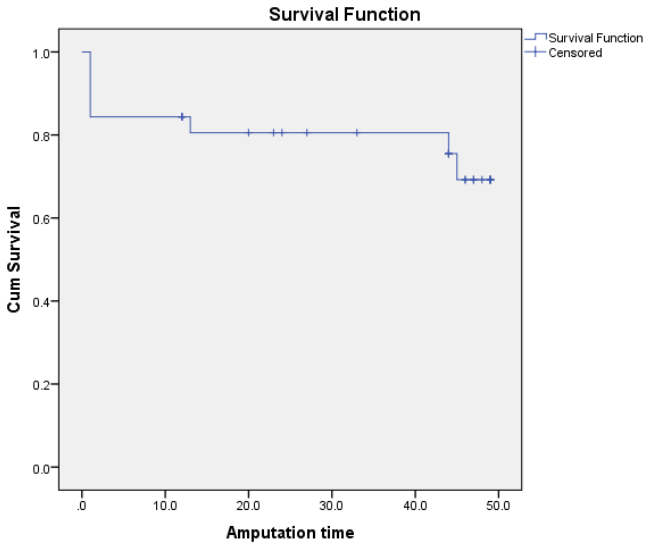

Figure 4 Overall amputation time

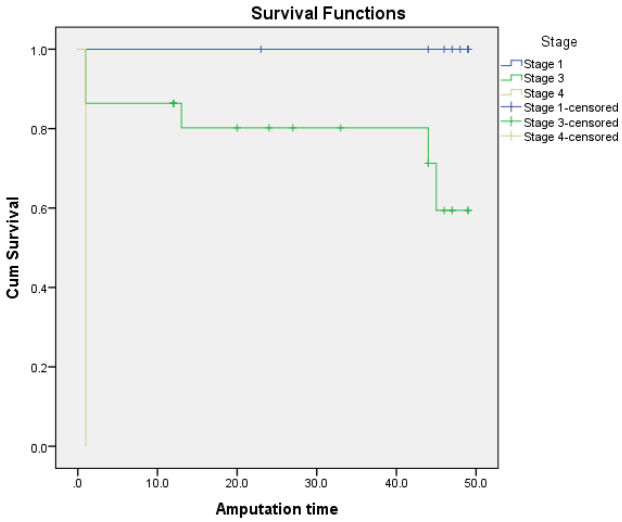

Figure 5 Disease stage's amputation time

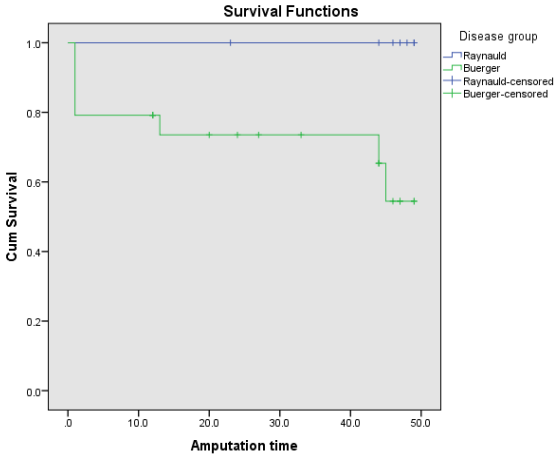

Figure 6 Disease group's amputation time

4. DISCUSSION

Surgical indications

Lumbar sympathectomy was firstly described in 1924. In 1973, endoscopic lumbar sympathectomy was reported with advantages overcame weak-points of open surgery and was considered "reviving" this treatment (Chander et al., 2004). Nowadays, a great number of specialists have accepted that effectiveness of endoscopic lumbar sympathectomy on two aspects (Sardinha et al., 2007; Walker, 1982): (1) have overcome disadvantages of traditional open surgery. (2) Have improved significantly in chronic lower extremities non-atherosclerosis ischemia disease (Buerger and Raynauld) that revascularization were unable to intervene. So, endoscopic lumbar sympathectomy has been indicated for (Walker, 1982): Relief of lower extremity pain; Plantar hyperhidrosis; Chronic lower extremities non-atherosclerosis ischemia disease (Buerger and Raynauld) that revascularization was unable to intervene (Abai and Ryan, 2013).

Endoscpoic lumbar sympathectomy technique

Endoscopic lumbar sympathectomy procedure could be performed via retroperitoneal approach (Chander et al., 2004). The surgical field was maintained by CO_2 pump with 12-15 mg Hg pressure. Surgeons usually used 3 trocars and if necessary, 4th trocar could be used to support a difficult operation. Surgeons performing endoscopic lumbar sympathectomy were trained and had experience in two ways: open lumbar sympathectomy and retroperitoneal endoscopic surgery. Peritoneal tear and bleeding were common causes of failure leading to open surgery.

Complications

Our study did not record any complications. That could be due to our small sample. Otherwise, we were well-trained and experienced surgeons. But, surgical accidents and complications were inevitable, especially in studies with large samples (Nemes et al., 2011). To clarify severe complications of endoscopic retroperitoneal lumbar sympathectomy (Hourlay et al., 1995; Nemes et al., 2011), we mentioned these points:

Bleeding complication could occur any time intraoperation, usually due to injuries of the retroperitoneal vessels. Regarding near anatomical structures, the two major vessels were mentioned: abdominal aorta on the left side, abdominal vena cava on the right side. Injuries of these vessels were catastrophic because they were the most serious complications that could lead to patient's deaths. Therefore, when dissecting sympathetic ganglion chain, surgeons had to identify abdominal vena cava if on the right side and abdominal aorta if on the left side. This was especially difficult in obese patients who had a lot of fat tissues in the retroperitoneal space and even more difficult on the right side. Indeed, abdominal aorta was easier to identify than abdominal vena cava because of its pulse. If surgeons were uncareful, they would be easy to damage abdominal vena cava because the veins were soft, non-pulsating and hided retroperitoneal fat tissues. Our experiences showed these veins identified with "soft blue tube". We recomended that abdominal vena cava must be identified before finding sympathetic ganglion chain. Other vessels which could be due to bleeding were lumbar spinal arteries. Therefore, when dissecting sympathetic ganglion chain out of the spine, these arteries must be kept in mind. Average blood loss volume in our study was about 10ml, equivalent to absorbed blood in 2 endoscopic gauzes and we did not record any significant bleeding. Some reports showed bleeding complications inducing failure of endoscopic surgery and conversing to open surgery for control bleeding.

Ureteral injury complications could be encountered due to confusing ureter with sympathetic ganglion chain. The ureteral injuries could be found right-away intraoperation or in post-op period. These complications were recognized by urine through drainage tube or remained fluid in the retroperitoneal cavity. To avoid ureteral injuries, a key point that distinguished ureter from other organs was tubular peristaltic structure. Intestinal injury often accompanied with peritoneal tear. When the peritoneum was torn, CO_2 entered abdominal cavity and surgical field was limited. It was difficult to perform an operation. Many cases could be unable to continue endoscopic surgery and had to converse to open surgery. In case of torn peritoneum, serious complication could happen to damage abdominal organs such as bowel.

Intestinal injuries could be perforation, paralytic ileus, or mesenteric injuries causing intestinal ischemia (Rulli et al., 2006). If intestinal injuries were missed, patients would die of peritonitis or intestinal necrosis. To prevent this complication, surgeons did not tear the peritoneum intraoperation. And, if the peritoneal was torn, surgeons must assess carefully risks of damaged abdominal organs. Then, a post-op closely follow-up was necessary. Subcutaneous emphysema was occured in case of high-pressure CO_2 intraoperation. It could lead to high CO_2 concentration causing acidosis. This complication could be managed by reducing pressure of CO_2 pump. Normally, the pressure required to maintain the surgical field was 12 – 15 mm Hg. Subcutaneous emphysema was usually resolved by the body's absorption in 3 – 5 days.

Post-op fluid accumulation and abscess could be encountered due to much electrocautery intraoperation, especially in obese patients (a lot of retroperitoneal fat tissues). Too much fluid accumulation could be infected and that caused residual abscess. In addition, this would also be an alarm of ureteral injury if drainage fluid looked like urine. Therefore, drainage of retroperitoneal cavity was recommended in case of predicted fluid accumulation or suspected ureteral injury.

Outcomes

After endoscopic retroperitoneal lumbar sympathectomy, patients were followed up in post-op period. Short-term outcomes showed results which were statistically significant better than preoperation. Symptoms significantly improved: numbness, intermittent claudication, rest pain, pulselessness, coldness, pallor (Beglaibter et al., 2002; Nemes et al., 2011; Sardinha et al., 2007). But, other symptoms were unchanged: gangrene, dystrophy of legs and paralysis.

After 1 year, mid-term outcomes showed symptoms: intermittent claudication, rest pain, numbness, pulselessness, pallor, coldness were statistically significant better than preoperation but less than short-term results. Symptoms dystrophy of legs, gangrene, paralysis, ABI were statistically significant less than preoperation and short-term results. They showed trend of "progressive disease". So, 1 year later, results remained an improvement compared to preoperation but tended to decrease compared to short-term condition.

Raynauld group showed improved symptoms and they were remained after 1 year. Our study showed that overall amputation rate was 25% and average amputation time was 39.6 months. The amputation rate calculated separately for each group showed that the Buerger group had an amputation rate of 33% while none were observed in the Raynauld group. Amputation time depended on cause and stages of the disease. Amputation time of severe stage was shorter than mild stage's. Buerger group also had shorter amputation time than Raynauld group.

5. CONCLUSION

Endoscopic retroperitoneal lumbar sympathectomy was safe and effective treatment. It was an option for patients with chronic lower extremity non-atherosclerotic ischemia (specifically: Raynauld and Buerger disease), especially in the early stages. Surgical indication was absolute for Raynauld disease.

Contribution of the authors

All authors has contributed equally to this work. All authors were read and approved the final manuscript. All authors has agreed to publish this manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee of Pham Ngoc Thach University of Medicine (ethical approval code: 125/HDDD-TDHYKPNT).

Funding

This study has not received any external funding.

Conflicts of interest

The authors declare that they have no conflict of interest.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Abai B, Ryan SP. Lumbar Sympathectomy.PanVascular MedicineIntegrated Clinical Management, Springer Berlin Heidelberg: Berlin, Heidelberg. 2013; 1-12.
2. Baker DM, Lamerton AJ. Operative lumbar sympathectomy for severe lower limb ischaemia: still a valuable treatment option. Ann R Coll Surg Engl 1994; 76(1). 50-3.
3. Beglaibter N, Berlatzky Y, Zamir O, Spira RM, Freund HR. Retroperitoneoscopic lumbar sympathectomy. J Vasc Surg 2002; 35(4). 815-7.
4. Chander J, Singh L, Lal P, Jain A, Lal P, Ramteke VK. Retroperitoneoscopic lumbar sympathectomy for buerger's disease: a novel technique. JSLS 2004; 8(3). 291-6.

5. Della Giovampaola C, Conte M, Caldarelli C, Zampieri F, Battaglia N, Spisni R, Parente B, Caldarelli G. Retroperitoneoscopic lumbar sympathectomy for nonreconstructable arterial occlusive disease. Minerva Chir 2006; 61(5). 409-15.
6. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), McGill Pain Questionnaire (MPQ), Short-Form McGill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). Arthritis Care Res (Hoboken) 2011; 63 Suppl 11(S240-52.
7. Hourlay P, Vangertruyden G, Verduyckt F, Trimpeneers F, Hendrickx J. Endoscopic extraperitoneal lumbar sympathectomy. Surg Endosc 1995; 9(5). 530-3.
8. Nemes R, Surlin V, Chiutu L, Georgescu E, Georgescu M, Georgescu I. Retroperitoneoscopic lumbar sympathectomy: prospective study upon a series of 50 consecutive patients. Surg Endosc 2011; 25(9). 3066-70.
9. Rulli F, Galata G, Micossi C, Dell'isola C. Massive intestinal infarction following retroperitoneoscopic right lumbar sympathectomy. J Minim Access Surg 2006; 2(4). 222-3.
10. Sardinha WE, Silvestre JMdS, Thomazinho F, Oliveira RGd, Morais Filho Dd. Retroperitoneal endoscopic lumbar sympathectomy. Jornal Vascular Brasileiro 2007; 6(339-343.
11. Walker PM. Is there still a place for lumbar sympathectomy? Can Med Assoc J 1982; 127(5). 353-4.
12. Woessner J. Overview of pain: Classification and concepts. Weiner's Pain Management: A Practical Guide for Clinicians 2006. 35-48.